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(56) Documents Cited

**GB 2303333 A GB 2292115 A GB 2276589 A**

(58) Field of Search

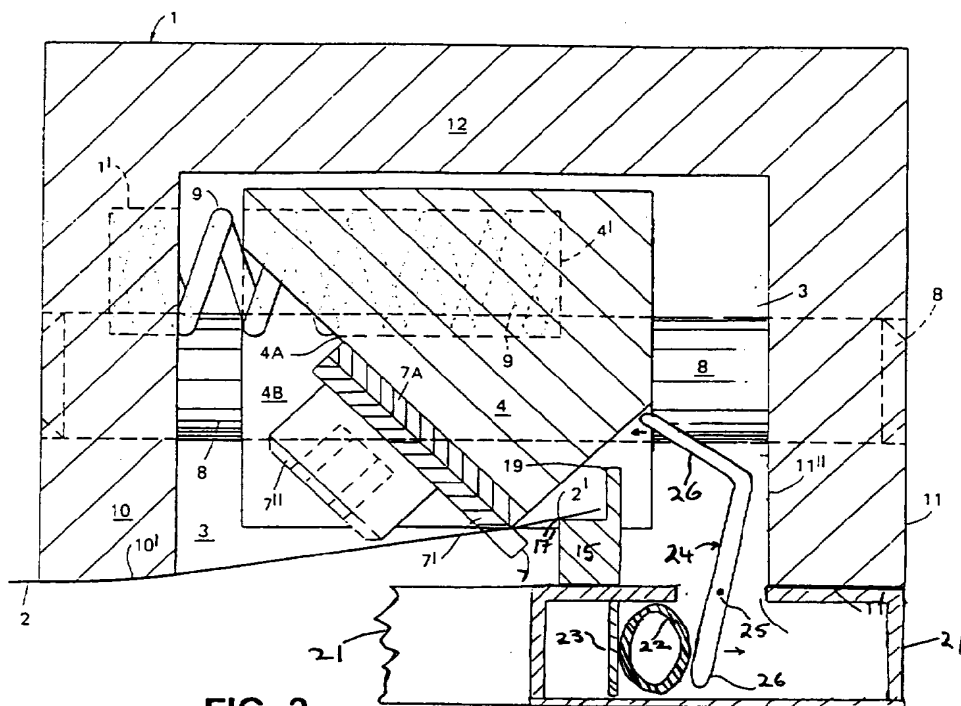
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(54) **Improved stencil tensioning frame and stencil mounting/dismounting apparatus therefor**

(57) A mounting apparatus for facilitating the mounting the mounting/dismounting of a stencil on a support and tensioning frame, said apparatus comprising a support base for supporting a stencil and from which there extend a pressure transmitting member or members displaceable by optionally operable displacing means to act against the support and tensioning means of the support and tensioning means of the support and tensioning frame and to displace said means against biasing means of the frame.



**FIG. 3**

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

The print reflects an assignment of the application under the provisions of Section 30 of the Patents Act 1977.

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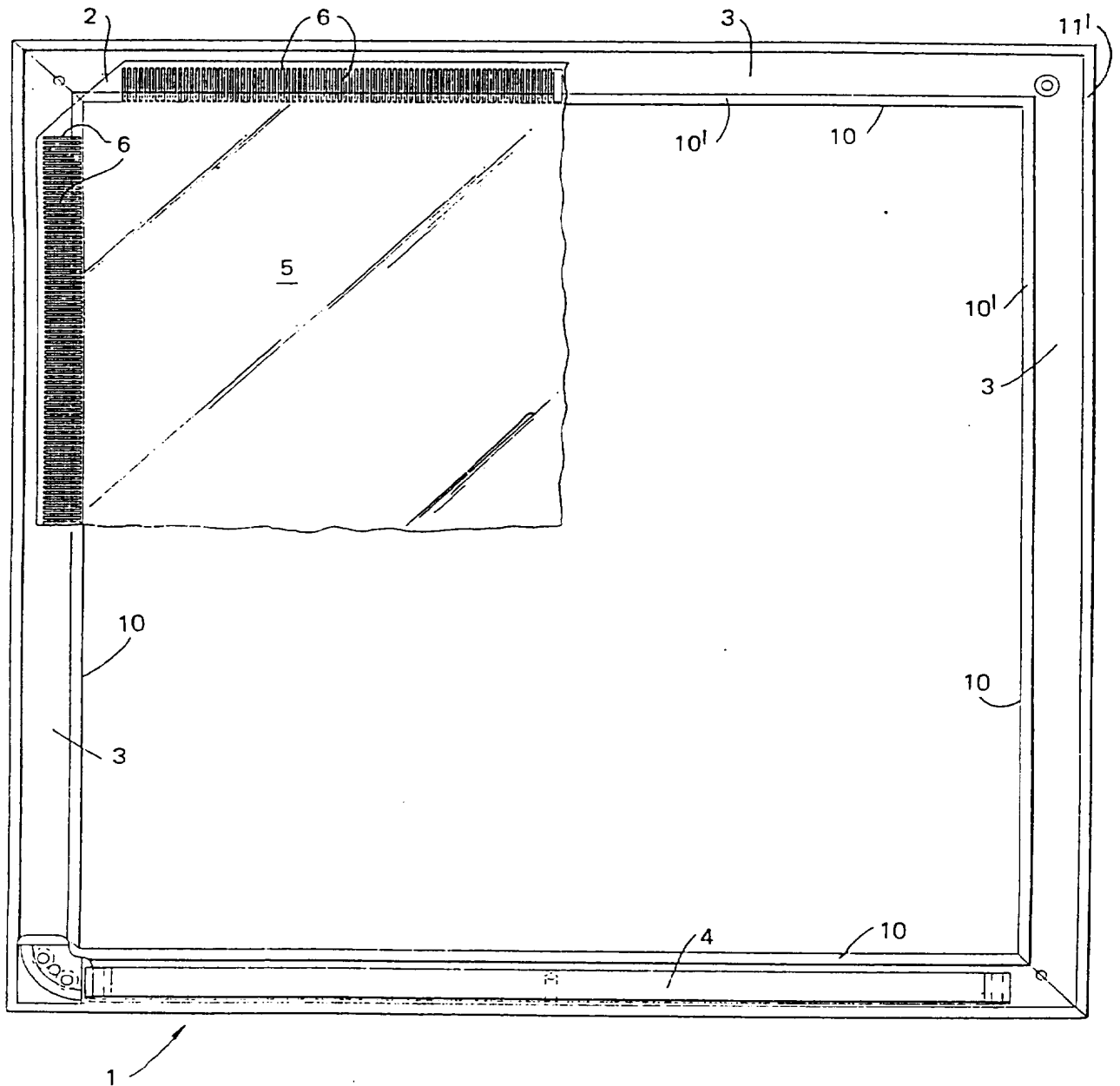
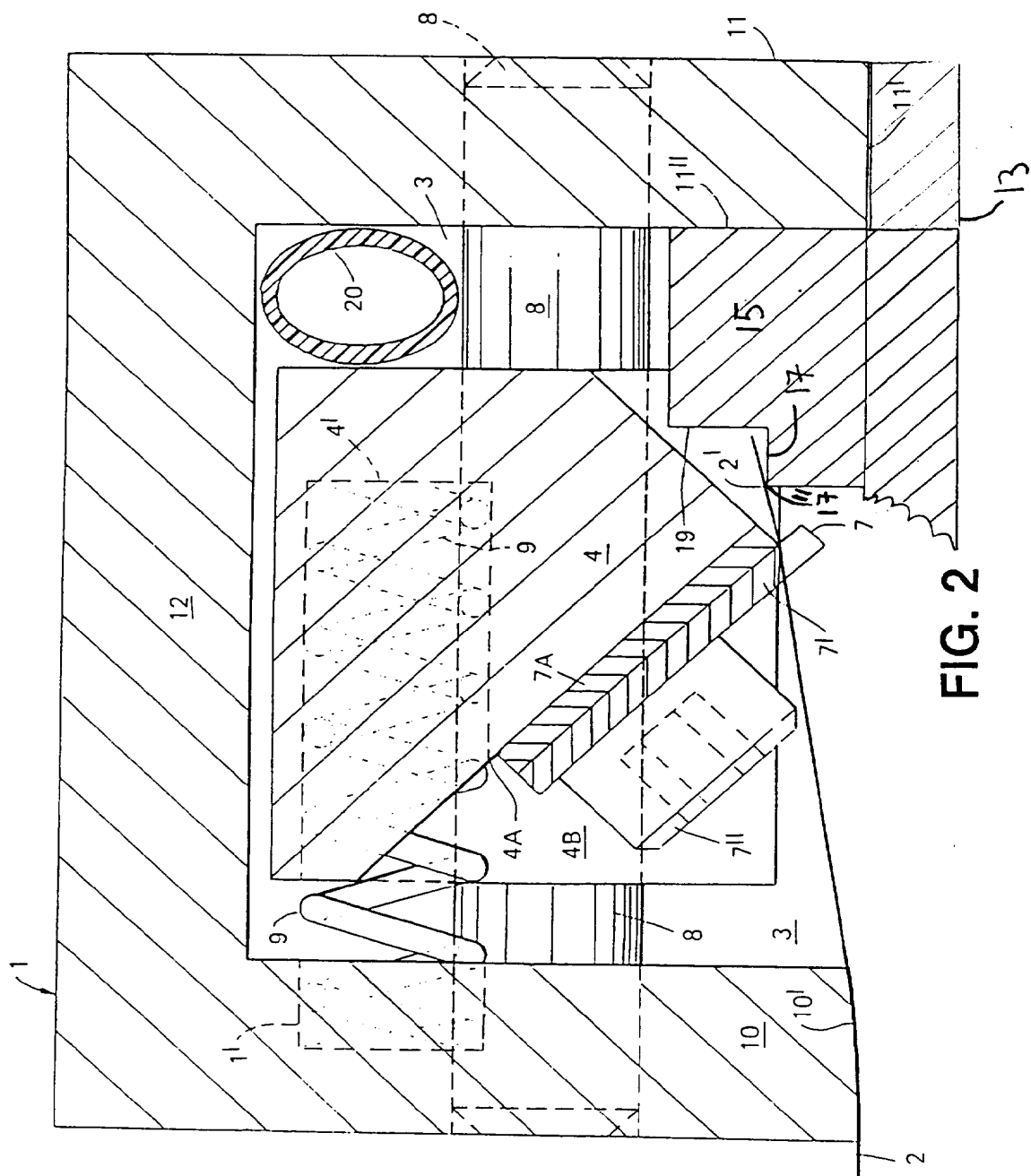
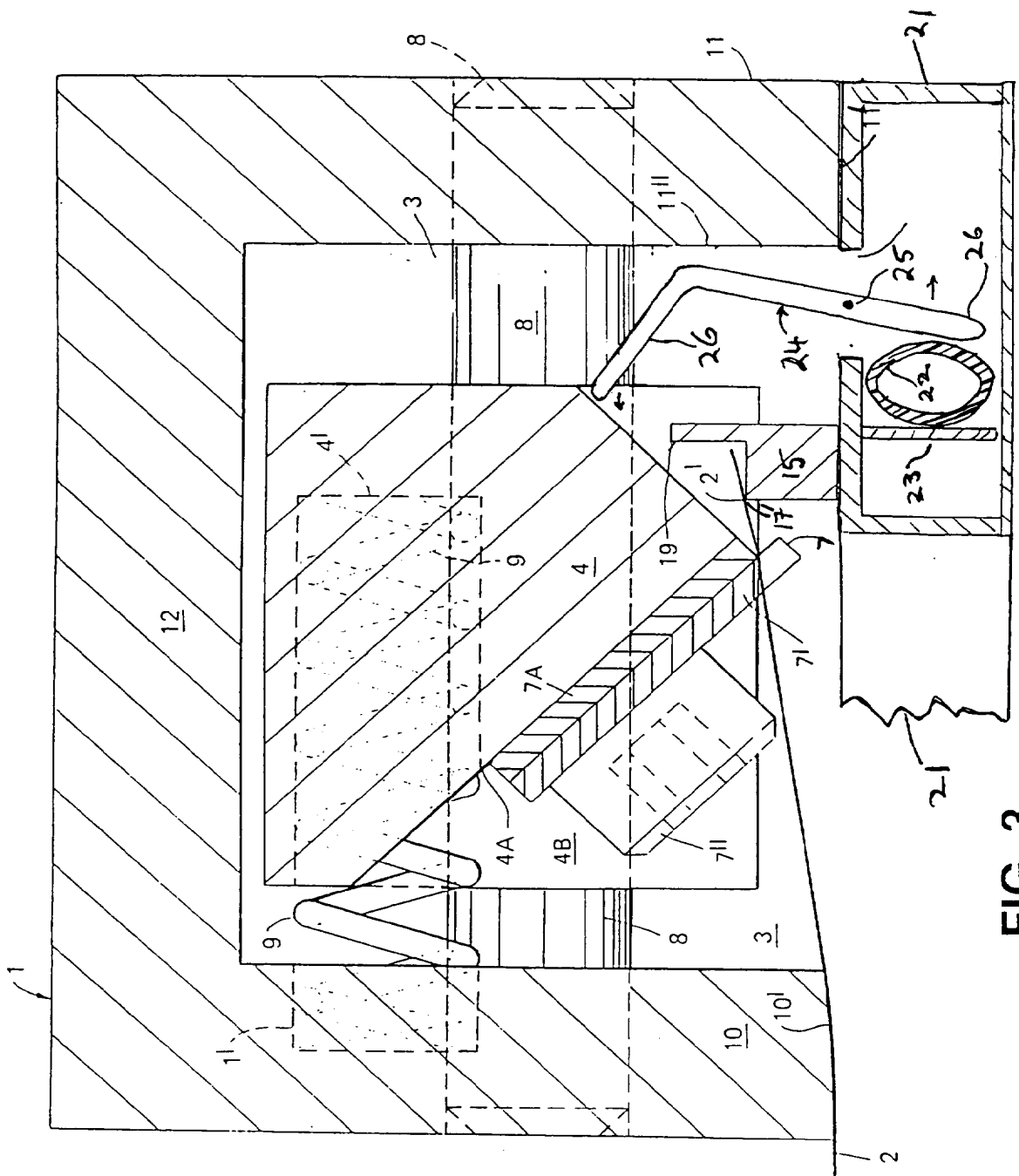


FIG. 1





**FIG. 3**

IMPROVED STENCIL TENSIONING FRAME AND STENCIL  
MOUNTING/DISMOUNTING APPARATUS THEREFOR

The present invention relates to improved stencil tensioning frame and stencil mounting/dismounting apparatus therefor.

In the Applicants British Patent 2264460 there is disclosed a support and tensioning frame for a metal stencil/screen wherein tensioning bars with mounting teeth are illustrated displaceable on opposite sides of a rectangular frame whilst in the Applicant's co-pending GB Application 9514927.4 the invention is further developed by having a support and tensioning frame with displaceable mounting/tensioning bars and projecting teeth on four sides of the frame with the tensioning bars being displaceable in the same plane and being permanently biased outwardly by springs into the stencil engaging position. An optionally operable displacing means in the form of a pneumatically inflatable tube extends around the tensioning frame and is inflatable to displace the tensioning bars against the biasing springs to enable mounting/dismounting of a stencil which is supported on a mounting device or "jig". The provision of such displacing means on each frame adds to costs and may restrict the manner of cleaning of the frame after use.

It is an object of the present invention to provide an optionally operable displacing means on a stencil mounting apparatus or "jig" rather than on the support and tensioning frame itself but co-operable therewith to displace the tensioning bars of the tensioning frame to permit mounting/dismounting of a stencil.

According to the present invention there is provided mounting apparatus for facilitating the mounting/dismounting of a stencil on a support and tensioning frame, comprising a support base for supporting a stencil and from which there extend pressure transmitting members displaceable by optionally operable displacing means to act against the support and tensioning means of the support and tensioning frame and to displace said means against biasing means of the frame.

Preferably there extend from the support base at least two spaced apart projections providing supporting surfaces for engagement with at least two opposite edges of a rectangular or square stencil when the stencil is located extending therebetween such that the stencil is freely supportable and downwardly flexible, the said projections restraining downward deflection of the edge regions of the stencil which is otherwise flexed against an elongate support surface of the frame.

Preferably the pressure transmitting member or members each comprise a lever means, such as an elongate bar, extending along each side of the support base adjacent the tensioning means of the tensioning frame and one side end being acted upon by the optionally operable displacing means and the other side end acting on the tensioning means of the support frame.

Preferably the optionally operable displacing means comprises an inflatable tube acting against the pressure transmitting member which is displaceable to act against the tensioning means or bar of the stencil tensioning frame, preferably somewhat similar to the manner in which the inflatable tube in Application 9514927.4 operates except that in the present case the

tube is located in the mounting apparatus or jig and its force is transmitted by transmission means such as lever means to the tensioning frame. Alternatively the optionally operable displacing means might be piston-cylinder arrangement pneumatically or hydraulically operable and preferably linked together to move together.

Preferably each lever means comprises a pivotably displaceable lever or bar which is preferably angled or shaped to make appropriate engagement with the tensioning bar of the tensioning frame and is pivotally mounted in the mounting apparatus and displaceable by an actuator, preferably in the form of an inflatable tube or other optionally operable displacing means.

Thus the present invention also provides a support and tensioning frame for a metal stencil including stencil mounting bars of at least two sides of the frame which are permanently biased to move away from each other into the stencil engaging position but without any optionally operable displacing means being provided for the frame. The present invention also denotes in a combination of mounting apparatus as defined on page 2 and a tensioning frame as defined above. Preferably the mounting apparatus will be in the form of a rectangular frame.

It will be appreciated that the present invention results in a support and tensioning frame for a stencil which does not have any optionally operable displacing means for the tensioning bars thereof and is consequently more economic to produce and additionally is lighter and may additionally be washed in cleaning fluids which because of their aggressive nature might otherwise tend to have a negative influence on hitherto optionally operable displacing means when located in the tensioning

frame.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Figs. 1 and 2 are provided for illustrative purposes of the stencil and mounting frame of co-pending Application 9514927, and are taken therefrom and

Fig. 1 is an inverted schematic plan view of a square supporting and tensioning frame for supporting a stencil (2) but primarily showing the channel (3) formation of the main part of the frame which is of substantially U-shaped section;

Fig. 2 is an enlarged fragmentary schematic section through one side of the stencil supporting and tensioning frame (1) and with the U-shaped channel (3) including the displaceable mounting bar (4) carrying a row of teeth, spring biasing means and an optionally inflatable displacing means together with the projection of a stencil supporting means; and

Fig. 3 is a schematic illustration of the possible disposition and operation of part of a mounting apparatus according to the present invention but with the inflatable tube (20) forming the optionally operable displacing means of the frame of Figs. 1 and 2 being omitted from the frame and incorporated in the mounting means.

The apparatus illustrated in Figs. 1 and 2 comprises a square support and tensioning a frame member 1 formed of channel sides 3 of substantially U-shaped section and for supporting and tensioning square stencil 2 (only a quadrant/quarter thereof being illustrated in the upper left-hand part of Fig. 1) which is tensionable

on the frame 1 by four rows of teeth 7 (only one shown) mounted on displaceable mounting or tensioning bars 4 locatable in the elongate slots in the four sides of the stencil to engage therein to tension the stencil 2. The teeth extend at  $45^\circ$  to the vertical.

In Fig. 1 the bottom of the apparatus is illustrated i.e. it is viewed from below in the position of use and also of mounting and dismounting. The stencil at least in its central region is the lowermost surface of the apparatus and normally has apertures (not shown) formed therein for the passage of solder paste.

Four elongate displaceable tensioning or mounting bars 4 are provided in the same plane with each one being reciprocally and linearly displaceably mounted on slider bars 8 extending between the walls (10,11) defining the channel sections 3 and a plurality of compression springs 9 are provided along each side and being located in bores 1' in the frame 1 and bores 4' in the bars 4 for biasing the mounting bars 4 into an outwardly displaced position in which the teeth 7 carried thereby in use engage in the apertures 6 along the sides of the stencil 2 and act to tension the stencil, with the outer edge regions of the stencil 2 being flexed out of the operative, lowermost main plane of the stencil sheet (over surfaces 10') - the teeth 7 also being located above said plane in use. The plurality of springs 9 are provided along each side to provide for balanced tensioning.

The normally inverted U-shaped channel section 3 illustrated in Fig. 2 comprising two limbs 10 and 11 connected by a web 12 and has an inner limb 10 with an elongate stencil support surface 10' which is preferably curved to provide a smooth transition and is located lower than the surface 17 of a stencil support 15 located

on base support 13 to be described and above the surface 11' of the outer limb 11 of the U-shaped section which surface 11' is intended to rest on an upper surface of a stencil support means 13. The upper surface of support 13 and vertical surface 11" of all the four members 15 act to precisely locate the frame 1 in position with the inner shoulder 1' also precisely locating the stencil so that when the stencil 2 is located between the four projections 15 it is precisely located and then the supporting tensioning frame 1 is lowered onto the mounting means 13 so that the surface 10' downwardly displaces the central portion of the stencil 2 with the outer edge 2' being supported on the shoulder 17 so that as the tensioning frame 1 is lowered, the teeth 7 on each of the mounting bars 4 enter into the apertures 6 in the side regions of the stencil 2.

Once the mounting frame has been located with the teeth extending through the elongate apertures 6 in the edge regions of the stencil, the optionally operable displacing means or tube 20 is depressurised with the result that the spring biasing means 9 urge the mounting bars 4 and teeth 7 of all the bars to move outwardly such that the teeth 7 cause the stencil 2 to be tensioned in an accurate and easy manner over surface 10'.

The plates 7' from which the rows of teeth 7 extend are removable if desired by suitable disengagement of threaded bolts 7" which abuts against an inclined surface 4' extending along a side of the bar 4.

Mounting/dismounting apparatus according to the invention and a stencil tensioning frame according to the present invention are illustrated in Fig. 3 and comprise

a square hollow box-like frame 21 (only partly shown in section in Fig. 3) which has the same periphery as tensioning frame 1 and contains a pneumatically inflatable tube 22 extending around the frame 21 and being closed at one end (not shown) and connected at the other end to valve means for connection to a source of pressurised air and operable to be optionally inflated (partially in Fig. 3) and deflated. The tube 22 is supported by the walls of frame 21 and retained on one side by a holding wall 23.

Four elongate angled strips or bars 24 are provided (only one shown) each forming a pressure transmitting member extending along a side of the frame 21 and each mounted in frame 21 to pivot about axle/axis 25 and has a lower end 26 against which tube 22 acts and an upper angled end 26 which is displaceable to abut the tensioning bar 4 and under the action of inflation of tube 22 to displace the bar 4 against the action of the biasing springs 9 to enable mounting or dismounting of a stencil 2. A suitable return spring (not shown) may act on bar 24 to return such on deflation of tube 22.

The frame 21 may alternatively be similar to frame 1 and securing and retaining means for tube 22 provided to permit it to act on lever bars 24. Clearly, the arrangement of Fig. 2 has to be modified to receive the lever bar 24 and such bar has to be shaped as to engage the tensioning bar 4. Alternative optionally operable displacing means might comprise pneumatically operable piston cylinders disposed to act on tensioning bars 4.

CLAIMS:

1. A mounting apparatus for facilitating the mounting the mounting/dismounting of a stencil on a support and tensioning frame, said apparatus  
5 comprising a support base for supporting a stencil and from which there extend a pressure transmitting member or members displaceable by optionally operable displacing means to act against the support and  
10 tensioning means of the support and tensioning means of the support and tensioning frame and to displace said means against biasing means of the frame.

2. A mounting apparatus as claimed in claim 1,  
15 wherein there extend from the support base at least two spaced apart projections providing supporting surfaces for engagement with at least two opposite edges of a rectangular or square stencil when the stencil is located extending therebetween such that  
20 the stencil is freely supportable and downwardly flexible, the said projections restraining downward deflection of the edge regions of the stencil which is otherwise flexed against an elongate support surface of the frame.

25 3. A mounting apparatus as claimed in claim 1 or claim 2, wherein the pressure transmitting member or members each comprise a lever means, preferably an elongate bar, extending along each side of the support  
30 base adjacent the tensioning means of the tensioning frame and one side end being acted upon by the optionally operable displacing means and the other side end acting on the tensioning means of the support frame.

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4. A mounting apparatus as claimed in any one of claims 1 to 3, wherein the optionally operable displacing means comprises an inflatable tube acting against the pressure transmitting member of members  
5 which is displaceable to act against the tensioning means of or bar of the stencil tensioning frame.

5. A mounting apparatus as claimed in claim 4, wherein the inflatable tube is located in the mounting  
10 apparatus and its force is transmitted by transmission means, preferably lever means, to the tensioning frames.

6. A mounting apparatus as claimed in claim 4,  
15 wherein the inflatable tube is located in a separate unit.

7. A mounting apparatus as claimed in any one of claims 3 to 6, wherein each lever means comprises a  
20 pivotably displaceable lever or bar angled or shaped to make appropriate engagement with the tensioning bar of the tensioning frame and pivotally mounted in the mounting apparatus and displaceable by an actuator.

25 8. A support and tensioning frame for a metal stencil, the said frame including stencil mounting bars on at least two sides of the frame which are permanently biased to move away from each other into the stencil engaging position but without any  
30 optionally operable displacing means being provided for the frame.

9. A combination of a mounting apparatus as  
35 claimed in any one of claims 1 to 7 and a tensioning frame as claimed in claim 7.



Application No: GB 9619621.7  
Claims searched: 1-7

Examiner: Tony Rudge  
Date of search: 8 December 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.O): B6C(CJB,CKW)  
Int Cl (Ed.6): B41F-015/36  
Other: ONLINE -WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2303333A (Williams)	
A	GB 2292115A (Baker)	
A	GB 2276589A (Williams)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.